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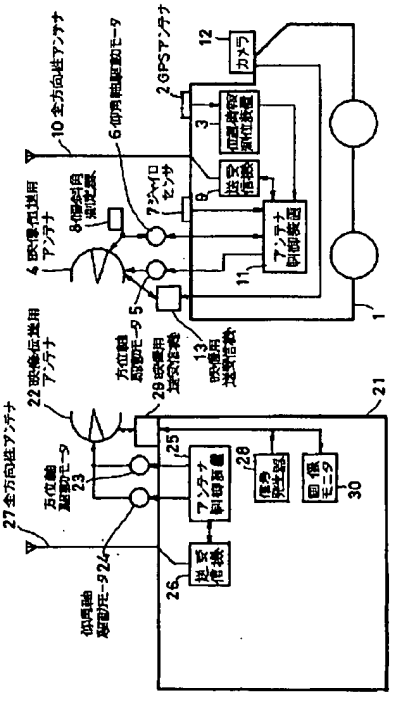
(54)【発明の名称】　遠隔操縦用アンテナ制御システム

(57)【要約】

【課題】　移動局および基地局間に中継基地を設ける必要があること。

【解決手段】　移動局１はＧＰＳアンテナ２、位置情報測位装置３を介して自己の位置をアンテナ制御装置１１に通知する。アンテナ制御装置１１はこの位置情報を送受信機９および全方向性アンテナ１０，２７を介して基地局２１のアンテナ制御装置２５へ送信する。基地局２１のアンテナ制御装置２５はこの位置情報に基づきモータ２３，２４を駆動して映像伝送用アンテナ２２を移動局１の方向に向け無変調信号を送信する。移動局１はこの無変調信号を映像伝送用アンテナ４を介して受信する。移動局１のアンテナ制御装置１１はこの信号の受信レベルが最大となるようモータ５，６を駆動して映像伝送用アンテナ４を基地局２１の方向に向ける。



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【特許請求の範囲】

【請求項1】　移動局とこの移動局を遠隔操縦する基地局との間で、広帯域データ伝送を行うための遠隔操縦用アンテナ制御システムであって、

前記移動局には、この移動局の位置を測定する第1の位置測定手段と、この第1の位置測定手段で測定された位置情報を前記基地局へ送信する位置情報送信手段と、前記基地局からの広帯域データを受信する第1の指向性アンテナと、この第1の指向性アンテナで受信した広帯域データに基づきこの広帯域データの到来方向を追尾する第1のアンテナ制御手段とを有し、

前記基地局には、前記移動局より送信された前記移動局の位置情報を受信する位置情報受信手段と、前記広帯域データを送信するための第2の指向性アンテナと、前記移動局より得られた位置情報に基づき前記第2の指向性アンテナを前記移動局の方向に向ける第2のアンテナ制御手段とを有する、

ことを特徴とする遠隔操縦用アンテナ制御システム。

【請求項2】　前記第1のアンテナ制御手段は前記第1の指向性アンテナで受信した広帯域データのレベルが最大となるよう前記第1の指向性アンテナの方向を制御する手段であることを特徴とする請求項1記載の遠隔操縦用アンテナ制御システム。

【請求項3】　前記第1の指向性アンテナで受信した広帯域データには追尾用データを含み、前記第1のアンテナ制御手段はこの追尾用データに基づき前記広帯域データの到来方向を追尾することを特徴とする請求項1または2記載の遠隔操縦用アンテナ制御システム。

【請求項4】　前記第1のアンテナ制御手段はさらに前記移動局の変位に基づき前記広帯域データの到来方向を追尾する手段を含むことを特徴とする請求項1～3いずれかに記載の遠隔操縦用アンテナ制御システム。

【請求項5】　前記位置情報送信手段および前記位置情報受信手段は無指向性アンテナを介して位置情報を送信および受信する手段であることを特徴とする請求項1～4いずれかに記載の遠隔操縦用アンテナ制御システム。

【請求項6】　前記基地局はさらにこの基地局の位置を測定する第2の位置測定手段を有し、前記第2のアンテナ制御手段は前記第2の位置測定手段より得られた基地局の位置と前記位置情報送信手段より得られた移動局の位置とに基づき前記第2の指向性アンテナを制御することを特徴とする請求項1～5いずれかに記載の遠隔操縦用アンテナ制御システム。

【請求項7】　前記第1および第2の位置測定手段は人工衛星より受信した位置情報に基づき前記移動局および基地局の位置を測定する手段であることを特徴とする請求項1～6いずれかに記載の遠隔操縦用アンテナ制御システム。

【発明の詳細な説明】

【0001】

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【発明の属する技術分野】本発明は遠隔操縦用アンテナ制御システムに関し、とくに危険作業区域等で使用する無人の移動局の遠隔操縦システムに用いる遠隔操縦用アンテナ制御システムに関する。

【0002】

【従来の技術】この種の技術の一例として実開昭63－26140号公報に、移動体および操作側に設けた全方向性アンテナを介して操作側より移動体を遠隔操作する技術が開示されている。これは、操作側からみて移動体側がどの方位方向に存在しても移動体を制御することができるように、操作側および移動体の両方に全方向性アンテナを設けたものである。

【0003】一方、特開平5－344033号公報に車載用衛星通信局システムの一例が開示されている。図3はこの車載用衛星通信局システムの構成図である。このシステムはアンテナ101と、このアンテナ101で受信した信号を増幅する低雑音増幅器102と、この増幅後の信号を周波数変換する受信周波数変換器103と、周波数変換された信号を復調する復調器104と、ベースバンド信号が変調される変調器105と、変調された信号が周波数変換される送信周波数周波数変換器106と、周波数変換された信号が増幅されアンテナ101に供給される107と、人工衛星からの位置情報を受信する小型アンテナ108と、受信した位置情報に基づき車の位置を測位する位置情報測位装置109と、測位結果に基づきアンテナ101を所望する衛星、たとえば所望の静止衛星の方向に向ける制御監視装置110とからなる。

【0004】このシステムは人工衛星からの位置情報に基づき車の位置を常時監視し、その位置に基づきアンテナ101を常時所望の静止衛星等に向けるものである。

【0005】

【発明が解決しようとする課題】しかし、移動体に搭載しているカメラからの映像等の広帯域データの伝送を行い、映像を見ながら移動体の遠隔操縦を行おうとする場合、実開昭63－26140号公報の技術を用いることができない。

【0006】それは、映像等の広帯域データを全方向性アンテナで送信することが困難だからである。すなわち、広帯域データの送信においてはノイズレベルが上がるため、出力を上げなければならない。ところが、高出力の信号を全方向性アンテナで送信すると不要な方向にも強力な信号が送信されるため、電波の有効利用の観点からあまり強力な電波を全方向性アンテナで送信するわけにはいかない。

【0007】そこで、高出力信号の送信が要求される場合は中継基地を介して広帯域データを送信していた。この場合、中継基地を必要とするという欠点がある。

【0008】一方、特開平5－344033号公報の技術は静止衛星等の静止した局に対してアンテナを常時向

けるための技術であり、静止衛星等からの電波は広い範囲、たとえば日本全体をカバーしているので、移動体側のアンテナを静止衛星等の方向に向けるだけで済み、静止衛星等のアンテナを移動体の方向に向ける必要はなかった。

【0009】ところが、移動局の遠隔操縦システムにおいては基地局から移動局に送信される電波も指向性を有するため、移動局のアンテナを基地局の方向に向けるのみならず基地局のアンテナを移動局の方向に向けることも必要となる。

【0010】このため、特開平5－344033号公報の技術をそのまま移動局の遠隔操縦に用いることはできない。

【0011】そこで本発明の目的は、中継基地を設けなくとも移動局および基地局間の回線を確保することが可能な遠隔操縦用アンテナ制御システムを提供することにある。

【0012】

【課題を解決するための手段】前記課題を解決するために本発明は、移動局とこの移動局を遠隔操縦する基地局との間で、広帯域データ伝送を行うための遠隔操縦用アンテナ制御システムであって、前記移動局には、この移動局の位置を測定する第1の位置測定手段と、この第1の位置測定手段で測定された位置情報を前記基地局へ送信する位置情報送信手段と、前記基地局からの広帯域データを受信する第1の指向性アンテナと、この第1の指向性アンテナで受信した広帯域データに基づきこの広帯域データの到来方向を追尾する第1のアンテナ制御手段とを有し、前記基地局には、前記移動局より送信された前記移動局の位置情報を受信する位置情報受信手段と、前記広帯域データを送信するための第2の指向性アンテナと、前記移動局より得られた位置情報に基づき前記第2の指向性アンテナを前記移動局の方向に向ける第2のアンテナ制御手段とを有する、ことを特徴とする。

【0013】さらに本発明は、前記基地局はさらにこの基地局の位置を測定する第2の位置測定手段を有し、前記第2のアンテナ制御手段は前記第2の位置測定手段より得られた基地局の位置情報と前記位置情報送信手段より得られた移動局の位置情報とに基づき前記第2の指向性アンテナを制御することを特徴とする。

【0014】

【発明の実施の形態】本発明によれば、移動局より基地局に対して送信された移動局の位置情報に基づき、基地局は自己の指向性アンテナを移動局の方向に向け、移動局に対して広帯域データを送信する。この広帯域データは移動局で受信され、移動局はこの信号に基づき自己の指向性アンテナが基地局の方向に常時向くように制御する。

【0015】さらに、基地局にも位置測定手段を設けることにより、この位置測定手段により測定された基地局の位置情報と移動局より得られた移動局の位置情報の双方に基づき移動局の位置をより正確に測定することができる。

【0016】以下、本発明の実施例について添付図面を参照しながら説明する。図1は本発明に係る遠隔操縦用アンテナ制御システムの第1実施例の構成図である。

【0017】このシステムはとくに危険作業区域等で使用する無人の移動局の遠隔操縦システムであり、そのため移動局にその周辺の状況を映像で捕らえるビデオカメラを備え、その映像を映像伝送用アンテナを介して基地局に送信し、基地局ではこの映像を同様の映像伝送用アンテナを介して受信し、基地局でその映像を見ながら移動局を遠隔操縦するものである。そして、双方の映像伝送用アンテナを常時向かい合わせるための技術が本発明である。

【0018】遠隔操縦用アンテナ制御システムは移動局1と基地局21とからなる。

【0019】移動局1は、人工衛星からの位置情報を受信するGPS（Gloval Positioning System）アンテナ2と、このGPSアンテナ2で得た位置情報に基づき自局の位置を測位する位置情報測位装置3と、映像伝送用アンテナ4と、映像伝送用アンテナ4の方位を変える方位軸駆動モータ5と、映像伝送用アンテナ4の仰角を変える仰角軸駆動モータ6と、移動局1の方位を検出するジャイロセンサ7と、移動局1の傾斜角を測定する傾斜角測定器8と、位置情報等を基地局21との間で送受信するための送受信機9および全方向性アンテナ10と、方位軸駆動モータ5および仰角軸駆動モータ6を駆動して映像伝送用アンテナ4の向きを制御するアンテナ制御装置11と、移動局1の周辺の状況を映像で捕らえるビデオカメラ12と、ビデオカメラ12で捕らえた映像データの送信および基地局21からの映像データの受信を映像伝送用アンテナ4を介して行う映像用送受信機13とからなる。

【0020】基地局21は、映像伝送用アンテナ22と、映像伝送用アンテナ22の方位を変える方位軸駆動モータ23と、映像伝送用アンテナ22の仰角を変える仰角軸駆動モータ24と、方位軸駆動モータ23および仰角軸駆動モータ24を駆動して映像伝送用アンテナ22の向きを制御するアンテナ制御装置25と、位置情報等を移動局1との間で送受信するための送受信機26および全方向性アンテナ27と、無変調信号を発生する信号発生器28と、信号発生器28より出力される無変調信号の送信および移動局1からの映像データの受信を映像伝送用アンテナ22を介して行う映像用送受信機29と、映像用送受信機29で受信された映像が表示される画像モニタ30とからなる。

【0021】次に、このシステムの動作について説明する。まず、移動局1にて、人工衛星からの位置情報がGPSアンテナ2を介して位置情報測位装置3で受信され

ると、位置情報測位装置３ではその位置情報を基に、自局１の緯度、経度および高度の情報が計測される。そして、その計測結果はアンテナ制御装置１１に送られる。

【００２２】アンテナ制御装置１１はこの自局１の緯度、経度および高度の計測結果を送受信装置９および全方向性アンテナ１０を介して基地局２１へ送信する。

【００２３】この計測結果の送信には、１ｋＢＰＳ（Ｂｉｔ　Ｐｅｒ　Ｓｅｃｏｎｄ）から１０ｋＢＰＳ程度の低レートビットを利用する。これにより、この計測結果の送信用として、ゲインの低いアンテナの利用が可能で、その指向性が水平方向には全て一様に分布する全方向性アンテナ、すなわち全方向性アンテナ１０を使用する。この際、この全方向性アンテナ１０の仰角方向への指向性は、２０度から４０度程度に設定しておく。これは、移動局１自身の傾きが１０度～２０度程度と想定したためで、これ以上傾く場合は仰角方向の指向性をさらに広く設定しておく。

【００２４】これらの手段により、たとえ基地局２１から見た移動局１の方位が変わっても、あるいは移動局１が傾いても回線を確保することができ、移動局１の位置を基地局２１へ伝えることができる。

【００２５】全方向性アンテナ１０より送信された移動局１の位置情報は、基地局２１において、全方向性アンテナ２７で受信され、送受信機２６を介してアンテナ制御装置２５に送られる。

【００２６】アンテナ制御装置２５では、移動局１の位置情報より基地局２１から見た移動局の方位、仰角が算出され、映像伝送用アンテナ２２に取り付けられている方位軸駆動モータ２３および仰角軸駆動モータ２４が駆動され、映像伝送用アンテナ２２が移動局１の方向に向けられる。

【００２７】方位軸駆動モータ２３および仰角軸駆動モータ２４には、たとえばステップモータが用いられる。これにより、駆動ステップを計算することで映像伝送用アンテナ２２の方位軸の角度および仰角軸の角度とを認識することができる。

【００２８】このとき、移動局１に対するステップトラック追尾用信号として、無変調信号（周波数は映像データの送信周波数帯内の周波数）を信号発生器２８より映像用送受信機２９および映像伝送用アンテナ２２を介して移動局１へ送信する。

【００２９】映像伝送用アンテナ２２は、移動局１より送信される映像データを受信するアンテナなので高いゲインが必要である。そこで、使用周波数帯域５０ＧＨｚでビーム幅１．５度のもので構成する。

【００３０】アンテナ制御装置２５は、映像伝送用アンテナ２２の制御が終了すると、映像伝送用アンテナ２２が移動局１の方向に向いていることを送受信機２６および全方向性アンテナ２７を介して移動局１へ通知する。

【００３１】そして、この信号は移動局１の全方向性アンテナ１０および送受信機９を介してアンテナ制御装置１１へ送られる。

【００３２】アンテナ制御装置１１は、基地局の映像伝送用アンテナ２２より送信されるステップトラック用信号の信号レベルを基にステップトラック方式で移動局１の映像伝送用アンテナ４を基地局２１の方向へ向ける。

【００３３】ここにステップトラック方式とは、相手方の信号（本実施例では基地局２１の信号発生器２８にて発生した無変調信号）を受信し、その信号のレベルを段階的な値として捕え、そのレベルが最大となる方向に自局のアンテナを向けること、すなわち本実施例では移動局１の映像伝送用アンテナ４を基地局２１の方向へ向けることをいう。

【００３４】これにより、移動局１の映像伝送用アンテナ４および基地局２１の映像伝送用アンテナ２２を用いた回線が確立される。この回線は主に映像伝送用に用いられる。

【００３５】本実施例では映像伝送用アンテナ２２がビーム幅１．５度であるのに対し、映像伝送用アンテナ４には移動局１の振動および急激な変動の回線への影響を抑えるため、ビーム幅が１５度から２０度程度のアンテナが用いられる。

【００３６】この映像伝送用アンテナ４をステップトラック方式で駆動し、受信レベルのピークを捕らえたとき、アンテナ制御装置１１は映像伝送用アンテナ４に取り付けられている傾斜角測定器８および方位検出用ジャイロセンサ７の値に、そのときの映像伝送用アンテナ４の方位軸角を加えた値を夫々、仰角初期値および方位角初期値として内部のメモリ（不図示）に記憶させる。

【００３７】そして、その後は移動局１の動きに伴う傾斜角測定器８およびジャイロセンサ７の信号に基づき、アンテナ制御装置１１は仰角および方位角が仰角初期値および方位角初期値となるよう仰角軸駆動モータ６および方位軸駆動モータ５を制御する。

【００３８】方位軸駆動モータ５については、方位検出用ジャイロセンサ７のドリフト誤差の影響を少なくするため、移動局１の停止時間を利用して、適宜ステップトラックが行われ、映像伝送用アンテナ４の方位の再設定が行われる。

【００３９】このように移動局１用の映像伝送用アンテナ４と基地局２１用の映像伝送用アンテナ２２とが常時向かい合うよう制御されることにより、移動局１のカメラ１２で撮影された移動局１の周囲の映像は基地局２１の画像モニタ３０にて良好に画像表示される。

【００４０】次に、第２実施例について説明する。図２は第２実施例の構成図である。なお、第１実施例と同様の構成部分については同一番号を付し、その説明を省略する。

【００４１】第２実施例が第１実施例と異なる点は、基地局２１に移動局１に設けたのと同様なＧＰＳアンテナ

３１および位置情報測位装置３２を設けた点である。その他は第１実施例と同様である。

【００４２】このように構成することにより、基地局２１では、アンテナ制御装置２５において、ＧＰＳアンテナ２を介して位置情報測位装置３で計測した移動局１の位置をＧＰＳアンテナ３１を介して位置情報測位装置３２で計測した基地局２１の位置との相対値で評価することができるため、より精度よく基地局２１側の映像伝送用アンテナ２２を移動局１側へ向けることができる。

【００４３】

【発明の効果】本発明によれば、移動局には、この移動局の位置を測定する第１の位置測定手段と、この第１の位置測定手段で測定された位置情報を前記基地局へ送信する位置情報送信手段と、基地局からの広帯域データを受信する第１の指向性アンテナと、この第１の指向性アンテナで受信した広帯域データに基づきこの広帯域データの到来方向を追尾する第１のアンテナ制御手段とを有し、基地局には、移動局より送信された移動局の位置情報を受信する位置情報受信手段と、広帯域データを送信するための第２の指向性アンテナと、移動局より得られた位置情報に基づき第２の指向性アンテナを移動局の方向に向ける第２のアンテナ制御手段とを有するよう構成したため、中継基地を設けなくとも移動局および基地局間の回線を確保することが可能となる。

【００４４】さらに、基地局に基地局の位置を測定する第２の位置測定手段を有し、第２のアンテナ制御手段は

第２の位置測定手段より得られた基地局の位置情報と移動局の位置情報送信手段より得られた移動局の位置情報とに基づき前記第２の指向性アンテナを制御することにより、より精度よく基地局側の第２の指向性アンテナ２２を移動局１側へ向けることができる。

【図面の簡単な説明】

【図１】本発明に係る遠隔操縦用アンテナ制御システムの第１実施例の構成図である。

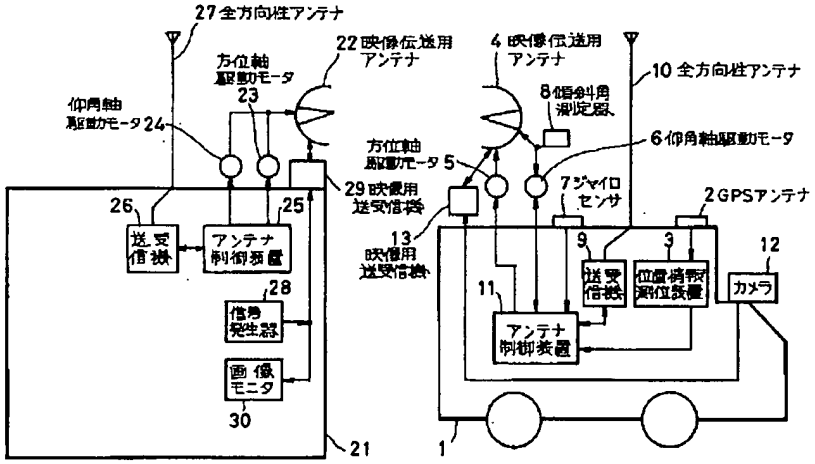
【図２】同システムの第２実施例の構成図である。

【図３】従来の車載用衛星通信局システムの構成図である。

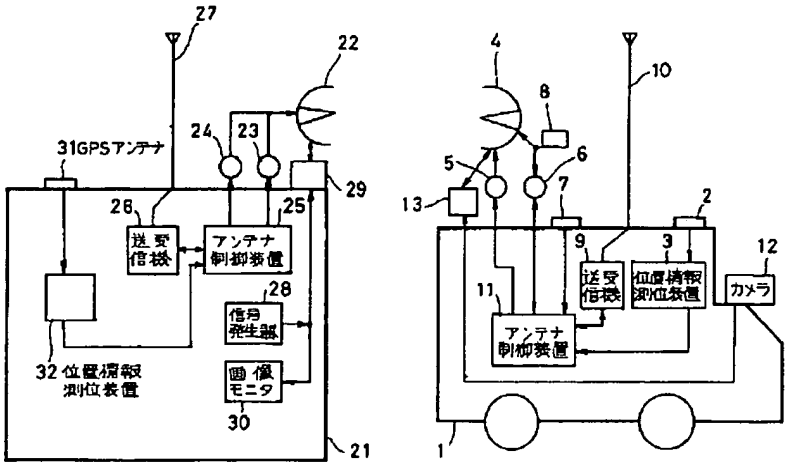
【符号の説明】

１　移動局
２　ＧＰＳアンテナ
３　位置情報測位装置
４，２２　映像伝送用アンテナ
５，２３　方位軸駆動モータ
６，２４　仰角軸駆動モータ
７　ジャイロセンサ
８　傾斜角測定器
９，２６　送受信機
１０，２７　全方向性アンテナ
１１，２５　アンテナ制御装置
１３，２９　映像用送受信機
２１　基地局
２８　信号発生器

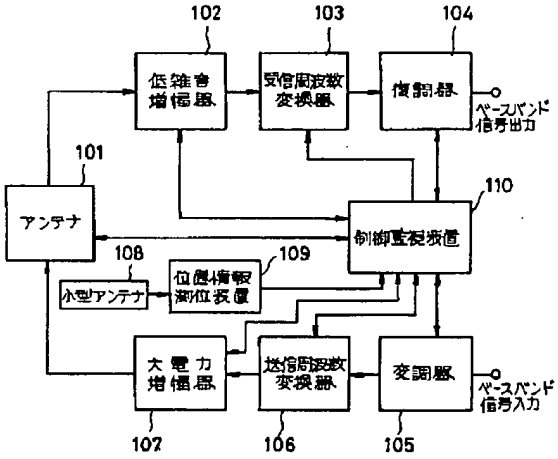
【図１】



【図2】


27
22
31GPSアンテナ
24
23
29
26
25
送受信機
アンテナ制御装置
28
信号発生器
32 位置情報測位装置
画像モニタ
30
21
4
8
10
5
6
13
7
2
9
3
12
11
送受信機
位置情報測位装置
カメラ
アンテナ制御装置
1

【図3】


102
103
104
低雑音増幅器
受信周波数変換器
復調器
ベースバンド信号出力
101
110
アンテナ
制御監視装置
108
109
小型アンテナ
位置情報測位装置
大電力増幅器
送信周波数変換器
変調器
ベースバンド信号入力
107
106
105

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NAME COUNTRY
NEC CORP N/A

APPL-NO: JP08040225

APPL-DATE: February 28, 1996

INT-CL (IPC): H04Q009/00, H04Q009/02

ABSTRACT:

PROBLEM TO BE SOLVED: To control the directional antenna of a mobile station itself so as to turn the directional antenna toward a base station at all times based on the signal of wide band data by turning the directional antenna of the base station itself toward the mobile station based on the position information of the mobile station and transmitting this signal of wide band data to the mobile station.

SOLUTION: A mobile station 1 reports its own position through a GPS antenna 2 and a position information measuring instrument 3 to an antenna controller 11. The antenna controller 11 transmits this position information through a transmitter/receiver 9 and full directional antennas 10 and 27 to an antenna controller 25 at a base station 21. The antenna controller 25 at the base station 21 turns an antenna 22 for video transmission toward the mobile station 1 by driving motors 23 and 24 based on this position information and transmits a non-modulated signal. The mobile station 1 receives this non- modulated signal through an antenna 4 for video transmission. The antenna controller 11 at the mobile station 1 turns the antenna 4 for video transmission toward the base station 21 by driving motors 5 and 6 so that the reception level of this signal can be maximum.

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(22)Date of filing : 28.02.1996 (72)Inventor : YAMANE TOSHINOBU

(54) ANTENNA CONTROL SYSTEM FOR REMOTE CONTROL

(57)Abstract:

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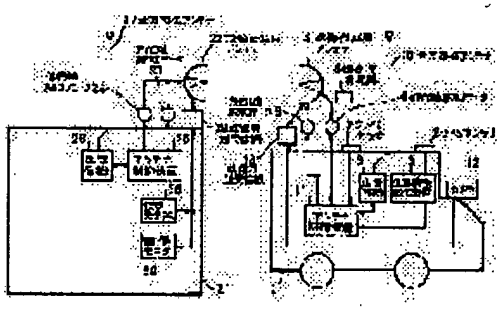

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[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

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CLAIMS

[Claim(s)]
[Claim 1] It is an antenna control system for remote control for performing broadband data transmission between the base stations which carry out remote control of a mobile station and this mobile station. To said mobile station The 1st location measurement means which measures the location of this mobile station, and a positional information transmitting means to transmit the positional information measured with this 1st location measurement means to said base station, The 1st directional antenna which receives the broadband data from said base station, It has the 1st antenna control means which follows the arrival direction of this broadband data based on the broadband data received with this 1st directional antenna. In said base station A positional information receiving means to receive the positional information of said mobile station transmitted from said mobile station, The antenna control system for remote control characterized by what it has for the 2nd directional antenna for transmitting said broadband data, and the 2nd antenna control means which turns said 2nd directional antenna in the direction of said mobile station based on the positional information acquired from said mobile station.
[Claim 2] Said 1st antenna control means is an antenna control system for remote control according to claim 1 characterized by being a means to control the direction of said 1st directional antenna so that the level of the broadband data received with said 1st directional antenna serves as max.
[Claim 3] It is the antenna control system for remote control according to claim 1 or 2 characterized by said 1st antenna control means following the arrival direction of said broadband data based on this data for tailing at the broadband data received with said 1st directional antenna including the data for tailing.
[Claim 4] claims 1-3 characterized by said 1st antenna control means including a means to follow the arrival direction of said broadband data based on the variation rate of said mobile station further -- the antenna control system for remote control given in either.
[Claim 5] claims 1-4 characterized by said positional information transmitting means and said positional information receiving means being means to mind a nondirectional antenna, and to transmit and receive positional information -- the antenna control system for remote control given in either.
[Claim 6] claims 1-5 characterized by for said base station to have the 2nd location measurement means which measures the location of this base station further, and for said 2nd antenna-control means to control said 2nd directional antenna based on the location of the base station obtained from said 2nd location measurement means, and the location of the mobile station obtained from said positional-information transmitting means -- the antenna-control system given in either for remote control.
[Claim 7] claims 1-6 characterized by said 1st and 2nd location measurement means being means to measure the location of said mobile station and a base station based on the positional information received from the satellite -- the antenna control system for remote control given in either.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the antenna control system for remote control used for the remote handling system of the uninhabited mobile station used by a risk work area etc. about the antenna control system for remote control.
[0002]
[Description of the Prior Art] The technique which operates a mobile by remote control from an actuation side to JP,63-26140,U through the omnidirectional antenna formed in the mobile and actuation side as an example of this kind of technique is indicated. Even if a mobile side exists in which direction of bearing, in view of an actuation side, this forms an omnidirectional antenna in both an actuation side and a mobile so that a mobile can be controlled.
[0003] On the other hand, an example of the satellite communication station system for mount is indicated by JP,5-344033,A. Drawing 3 is this satellite communication office structure-of-a-system Fig. for mount. The low noise amplifier 102 which amplifies the signal to which this system received with an antenna 101 and this antenna 101, The receiving mixer 103 which carries out frequency conversion of the signal after this magnification, and the demodulator 104 which restores to the signal by which frequency conversion was carried out, The modulator 105 with which baseband signaling is modulated, and the transmit-frequencies frequency converter 106 with which frequency conversion of the modulated signal is carried out, 107 which the signal by which frequency conversion was carried out is amplified and is supplied to an antenna 101, It consists of the miniaturized antenna 108 which receives the positional information from a satellite, positional information positioning equipment 109 which positions the location of a vehicle based on the received positional information, and control supervisory equipment 110 turned in the direction of the satellite which asks for an antenna 101 based on a positioning result, for example, a desired geostationary satellite.
[0004] This system monitors the location of a vehicle continuously based on the positional information from a satellite, and always turns an antenna 101 to a desired geostationary satellite etc. based on that location.
[0005]
[Problem(s) to be Solved by the Invention] However, broadband data, such as an image from the camera carried in the mobile, are transmitted, and when it is going to perform remote control of a mobile, looking at an image, the technique of JP,63-26140,U cannot be used.
[0006] That is because it is difficult to transmit broadband data, such as an image, with an omnidirectional antenna. That is, an output must be raised in order that a noise level may go up in transmission of broadband data. However, since a powerful signal will be transmitted also in the unnecessary direction if the signal of high power is transmitted with an omnidirectional antenna, a not much powerful electric wave cannot be transmitted with an omnidirectional antenna from a viewpoint of a deployment of an electric wave.
[0007] Then, when transmission of a high power signal was required, broadband data were transmitted

through the relay base. In this case, there is a fault of needing a relay base.
[0008] On the other hand, the technique of JP,5-344033,A was a technique for always turning an antenna to the station which stood [geostationary satellite] it still, since the electric wave from a geostationary satellite etc. covered the large whole range, for example, Japan, what is necessary is just to have turned the antenna by the side of a mobile in the direction of a geostationary satellite etc., and antennas, such as a geostationary satellite, did not need to be turned in the direction of a mobile.
[0009] However, it is necessary it not only to turn the antenna of a mobile station in the direction of a base station, but the electric wave transmitted to a mobile station from a base station in the remote handling system of a mobile station, and to turn the antenna of a base station in the direction of a mobile station, since it has directivity.
[0010] For this reason, the technique of JP,5-344033,A cannot be used for remote control of a mobile station as it is.
[0011] Then, the purpose of this invention is to offer the antenna control system for remote control which can secure the circuit between a mobile station and a base station, even if it does not prepare a relay base.
[0012]
[Means for Solving the Problem] In order to solve said technical problem, this invention between the base stations which carry out remote control of a mobile station and this mobile station It is an antenna control system for remote control for performing broadband data transmission. To said mobile station The 1st location measurement means which measures the location of this mobile station, and a positional information transmitting means to transmit the positional information measured with this 1st location measurement means to said base station, The 1st directional antenna which receives the broadband data from said base station, It has the 1st antenna control means which follows the arrival direction of this broadband data based on the broadband data received with this 1st directional antenna. In said base station A positional information receiving means to receive the positional information of said mobile station transmitted from said mobile station, It is characterized by what it has for the 2nd directional antenna for transmitting said broadband data, and the 2nd antenna control means which turns said 2nd directional antenna in the direction of said mobile station based on the positional information acquired from said mobile station.
[0013] Furthermore, as for said base station, this invention has the 2nd location measurement means which measures the location of this base station further, and it is characterized by said 2nd antenna control means controlling said 2nd directional antenna based on the positional information of the base station obtained from said 2nd location measurement means, and the positional information of the mobile station obtained from said positional information transmitting means.
[0014]
[Embodiment of the Invention] According to this invention, based on the positional information of the mobile station transmitted from the mobile station to the base station, a base station turns a self directional antenna in the direction of a mobile station, and transmits broadband data to a mobile station. This broadband data is received by the mobile station, and a mobile station is controlled so that a self directional antenna is always suitable in the direction of a base station based on this signal.
[0015] Furthermore, based on the both sides of the positional information of the base station measured by this location measurement means, and the positional information of the mobile station obtained from the mobile station, the location of a mobile station can be more correctly measured by forming a location measurement means also in a base station.
[0016] Hereafter, it explains, referring to an accompanying drawing about the example of this invention. Drawing 1 is the block diagram of the 1st example of the antenna control system for remote control concerning this invention.
[0017] Especially this system is a remote handling system of the uninhabited mobile station used by a risk work area etc., therefore is equipped with the video camera which catches the situation of the circumference of it with an image to a mobile station, transmits that image to a base station through the antenna for image transmission, and this image is received through the same antenna for image

transmission, and it carries out remote control of the mobile station in a base station, looking at that image in a base station. And the technique for always opposing both antennas for image transmission is this invention.

[0018] The antenna control system for remote control consists of a mobile station 1 and a base station 21.

[0019] The GPS (Gloval Positioning System) antenna 2 with which a mobile station 1 receives the positional information from a satellite, The positional information positioning equipment 3 which positions the location of a local station based on the positional information acquired with this GPS antenna 2, The antenna 4 for image transmission, and the azimuth-axes drive motor 5 into which bearing of the antenna 4 for image transmission is changed, The elevation angle shaft drive motor 6 into which the elevation angle of the antenna 4 for image transmission is changed, and the gyroscope sensor 7 which detects bearing of a mobile station 1, The tilt-angle measuring instrument 8 which measures the tilt angle of a mobile station 1, and the transmitter-receiver 9 and omnidirectional antenna 10 for transmitting and receiving positional information etc. between base stations 21, The antenna control equipment 11 which drives the azimuth-axes drive motor 5 and the elevation angle shaft drive motor 6, and controls the sense of the antenna 4 for image transmission, It consists of a transmitter-receiver 13 for images which performs transmission of the image data which caught the surrounding situation of a mobile station 1 with the video camera 12 caught with an image, and the video camera 12, and reception of the image data from a base station 21 through the antenna 4 for image transmission.

[0020] The azimuth-axes drive motor 23 into which a base station 21 changes bearing of the antenna 22 for image transmission, and the antenna 22 for image transmission, The antenna control equipment 25 which drives the elevation angle shaft drive motor 24 into which the elevation angle of the antenna 22 for image transmission is changed, and the azimuth-axes drive motor 23 and the elevation angle shaft drive motor 24, and controls the sense of the antenna 22 for image transmission, The transmitter-receiver 26 and omnidirectional antenna 27 for transmitting and receiving positional information etc. between mobile stations 1, The transmitter-receiver 29 for images which performs transmission of the non-modulating signal outputted from the signal generator 28 which generates a non-modulating signal, and a signal generator 28, and reception of the image data from a mobile station 1 through the antenna 22 for image transmission, It consists of a picture monitor 30 as which the image received with the transmitter-receiver 29 for images is displayed.

[0021] Next, actuation of this system is explained. First, if the positional information from a satellite is received by the mobile station 1 with positional information positioning equipment 3 through the GPS antenna 2, with positional information positioning equipment 3, the LAT, the LONG, and the advanced information on a local station 1 will be measured based on the positional information. And the measurement result is sent to antenna control equipment 11.

[0022] Antenna control equipment 11 transmits the LAT, the LONG, and the advanced measurement result of this local station 1 to a base station 21 through a transmitter-receiver 9 and an omnidirectional antenna 10.

[0023] The low rate bit of 10kBPS extent from 1kBPS (Bit Per Second) is used for transmission of this measurement result. Thereby, use of the low antenna of gain is possible as an object for transmission of this measurement result, and that directivity uses the omnidirectional antenna 10 distributed uniformly horizontally [all], i.e., an omnidirectional antenna. Under the present circumstances, the directivity to the direction of an elevation angle of this omnidirectional antenna 10 is set as about 40 degrees from 20 degrees. This is because the inclination of mobile station 1 self assumed it as ten - about 20 degrees, and when inclining more than this, it sets up the directivity of the direction of an elevation angle still more widely.

[0024] With these means, whether bearing of the mobile station 1 seen from the base station 21 even if changes or a mobile station 1 inclines, a circuit can be secured, and the location of a mobile station 1 can be given to a base station 21.

[0025] In a base station 21, it is received by the omnidirectional antenna 27 and the positional information of the mobile station 1 transmitted from the omnidirectional antenna 10 is sent to antenna

control equipment 25 through a transmitter-receiver 26.
[0026] With antenna control equipment 25, from the positional information of a mobile station 1, bearing of the mobile station seen from the base station 21 and an elevation angle are computed, the azimuth-axes drive motor 23 and the elevation angle shaft drive motor 24 which are attached in the antenna 22 for image transmission drive, and the antenna 22 for image transmission is turned in the direction of a mobile station 1.
[0027] A step motor is used for the azimuth-axes drive motor 23 and the elevation angle shaft drive motor 24. Thereby, the include angle of the azimuth axes of the antenna 22 for image transmission and the include angle of an elevation angle shaft can be recognized by calculating a drive step.
[0028] At this time, a non-modulating signal (a frequency is a frequency in the transmit-frequencies band of image data) is transmitted to a mobile station 1 as a signal for step truck tailing over a mobile station 1 through the transmitter-receiver 29 for images, and the antenna 22 for image transmission from a signal generator 28.
[0029] Since the antenna 22 for image transmission is an antenna which receives the image data transmitted from a mobile station 1, high gain is required for it. Then, it is the thing of 1.5 beam width and constitutes from 50GHz of use frequency bands.
[0030] Antenna control equipment 25 notifies that the antenna 22 for image transmission is suitable in the direction of a mobile station 1 to a mobile station 1 through a transmitter-receiver 26 and an omnidirectional antenna 27, after control of the antenna 22 for image transmission is completed.
[0031] And this signal is sent to antenna control equipment 11 through the omnidirectional antenna 10 and transmitter-receiver 9 of a mobile station 1.
[0032] Antenna control equipment 11 turns the antenna 4 for image transmission of a mobile station 1 in the direction of a base station 21 with a step tracking system based on the signal level of the signal for step trucks transmitted from the antenna 22 for image transmission of a base station.
[0033] A step tracking system receives the other party's signal (non-modulating signal generated with the signal generator 28 of a base station 21 in this example) here, catches the level of the signal here as a gradual value, and says turning the antenna of a local station in the direction of a base station 21 in the direction in which the level serves as max, i.e., turning the antenna 4 for image transmission of a mobile station 1 in this example, to it.
[0034] Thereby, the circuit using the antenna 4 for image transmission of a mobile station 1 and the antenna 22 for image transmission of a base station 21 is established. This circuit is mainly used for image transmission.
[0035] In this example, in order to suppress the effect of the circuit on vibration of a mobile station 1 and rapid fluctuation at the antenna 4 for image transmission to the antennas 22 for image transmission being 1.5 beam width, the antenna of 15 to about 20 degrees is used for beam width.
[0036] When this antenna 4 for image transmission is driven with a step tracking system and the peak of receiving level is caught, antenna control equipment 11 makes internal memory (un-illustrating) memorize the value which added the bearing axial angle of the antenna 4 for image transmission at that time to the value of the tilt-angle measuring instrument 8 attached in the antenna 4 for image transmission, and the gyroscope sensor 7 for bearing detection as elevation angle initial value and azimuth initial value, respectively.
[0037] And after that, based on the signal of the tilt-angle measuring instrument 8 accompanying a motion of a mobile station 1, and the gyroscope sensor 7, antenna control equipment 11 controls the elevation angle shaft drive motor 6 and the azimuth-axes drive motor 5 so that an elevation angle and an azimuth serve as elevation angle initial value and azimuth initial value.
[0038] About the azimuth-axes drive motor 5, in order to lessen effect of the drift error of the gyroscope sensor 7 for bearing detection, using the stop time of a mobile station 1, a step truck is performed suitably and resetting of bearing of the antenna 4 for image transmission is performed.
[0039] Thus, by being controlled so that the antenna 4 for image transmission for mobile station 1 and the antenna 22 for image transmission for base station 21 always face each other, image display of the image around the mobile station 1 photoed with the camera 12 of a mobile station 1 is carried out good

h c g cg b eb cg e e

by the picture monitor 30 of a base station 21.

[0040] Next, the 2nd example is explained. Drawing 2 is the block diagram of the 2nd example. In addition, the same number is attached about the same component as the 1st example, and the explanation is omitted.

[0041] The point that the 2nd example differs from the 1st example is a point of having formed the GPS antenna 31 same with having prepared in the mobile station 1, and positional information positioning equipment 32 in the base station 21. Others are the same as that of the 1st example.

[0042] Thus, since a relative value with the location of the base station 21 which measured the location of the mobile station 1 measured with positional information positioning equipment 3 through the GPS antenna 2 with positional information positioning equipment 32 through the GPS antenna 31 in antenna control equipment 25 in the base station 21 can estimate by constituting, the antenna 22 for image transmission by the side of a base station 21 can be turned to a mobile station 1 side with a more sufficient precision.

[0043]

[Effect of the Invention] The 1st location measurement means which measures the location of this mobile station to a mobile station according to this invention, A positional information transmitting means to transmit the positional information measured with this 1st location measurement means to said base station, It has the 1st directional antenna which receives the broadband data from a base station, and the 1st antenna control means which follows the arrival direction of this broadband data based on the broadband data received with this 1st directional antenna. A positional information receiving means to receive the positional information of the mobile station transmitted to the base station from the mobile station, Since it constituted so that it might have the 2nd directional antenna for transmitting broadband data, and the 2nd antenna control means which turns the 2nd directional antenna in the direction of a mobile station based on the positional information acquired from the mobile station, Even if it does not prepare a relay base, it becomes possible to secure the circuit between a mobile station and a base station.

[0044] Furthermore, it has the 2nd location measurement means which measures the location of a base station to a base station, and the 2nd antenna control means can turn the 2nd directional antenna 22 by the side of a base station to a mobile station 1 side with a more sufficient precision by controlling said 2nd directional antenna based on the positional information of the base station obtained from the 2nd location measurement means, and the positional information of the mobile station obtained from the positional information transmitting means of a mobile station.

[Translation done.]